Supreme Commander for the Allied Powers



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# SMALLPOX
(Variola)

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## Definition

Smallpox is an acute infectious and highly communicable disease characterized clinically by a sudden onset, marked prodroma symptoms consisting of headache, severe pains in lumbar region of the back and fever. This is followed in two to four days' by the appearance of a characteristic skin eruption, which progresses successively through the stages of macule, papule, vesicle, pustule and crust to end in pitting or scar formation.

## Etiology

The etiological agent of smallpox is a filterable virus. It is present in secretions from the mouth, nose and throat, in material from the vesicles and pustules and in crusts of patient with the clinical disease. Virus may be present in the feces and urine.

## Incubation Period

The incubation period of smallpox is usually from ten to fourteen days from date of exposure to the onset of prodromal symptoms. It may occasionally be somewhat shorter than ten days or as long as sixteen days.

## Mode of Transmission

Transmission usually occurs by direct contact with person with the disease. Contacts need not be intimate, but aerial transmission is unlikely except over distances of a few feet. Transmission occurs indirectly through articles contaminated by body discharges and from lesions of patients, including feces and urine.

## Period of Communicability

A patient is infectious from the onset of prodromal symptoms throughout the course of the disease until all scabs and crusts have been shed. A patient is probably infectious a day or two before the prodromes and since the virus is present in the crus it is essential that all have dropped off, particularly from the palms and soles, before the patient can be said to be non-infectiou

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## Susceptibility and Immunity

Man is universally susceptible to smallpox without regard to age, race or sex. As a rule, one attack of smallpox confe permanent immunity to future attacks, but second attacks are said to occur occasionally, chicken pox probably having been confused with smallpox in some of the instances reported.

## Prevalence and Importance

Smallpox is worldwide in distribution. The incidence of smallpox depends upon the number of susceptible persons in the population. The prevalence is governed by the extent to which the members of any given community have been successfully vaccinated. Smallpox may occur at any time during the year, but the incidence is highest during the winter and spring. In an unvaccinated popula tion, smallpox is primarily a disease of childhood and tends to occur in epidemic form. In a partially vaccinated population, the unvaccinated individuals may, because of lack of exposure, escape the disease, but any unvaccinated individual, either child or adult who has not had smallpox will contract the disease whenever he is definitely exposed to the infection.

## Clinical Characteristics and Diagnosis

Classical smallpox begins abruptly with chills and a high temperature varying between 102° and 105° F., and is accompanied by prostration, nausea, vomiting, headache and severe pains in the lumbar region of the back. The stage of invasion lasts for tw to four days during which time there may be an evanescent morbilliform or scarlatiniform rash. The typical smallpox eruption appears on the twelfth to fourteenth day of the infection or between the second and fourth days of the prodromal symptoms. With the appearance of the discrete or confluent eruption, the temperature usually falls with symptomatic improvement. There is a secondary rise in temperature when the lesions become vesicular or pustular. If there are no complications, the temperature will usually be normal again by the tenth or twelfth day after onset. The eruption appears first and most abundantly on face, hands and wrists, spreading rapidly within twenty-four hours to include the forearms, arm and thorax. The abdomen and legs are often only slightly involved in mild cases. When the lesions are very numerous, they may become confluent, producing so-called confluent smallpox. In such cases the palms and soles are frequently involv Lesions also occur in the mucous membranes of the mouth, gastro intestinal tract and respiratory tract. On the first day of the eruption tiny macules appear on the skin; they become hard shotty papules on the second day and on the third day develop into multilocular vesicles which usually become umbilicated as the disease progresses. On the fifth day the vesicles begin to become pustular this being completed by the 7th or 8th day. The vesicles and pustules are surrounded by a red areola or inflamatory zone. The lesions are deep seated and have an infiltrated base except when the disease is modified by a partial immunity. When the pustules are uncomplicated they begin to dry up after the 8th day and

desqumation of the crusts begins twelve to fourteen days after the beginning of the eruption.

Differential Diagnosis

The disease most frequently confused with smallpox is chicken pox. In chicken pox the various stages of the lesions may be seen at the same time whereas in smallpox the lesions are usuall all in the same stage of development at the same time. A mild variety of smallpox, variola minor, is not uncommon and may cause considerable difficulty in diagnosis. The following table illustrates the principal diagnostic differences between smallpox and chicken pox.

The Differential Diagnosis of Smallpox and Chicken pox

| CHARACTERISTIC | SMALLPOX | CHICKEN POX |
|---|---|---|
| Incubation Period | 10 to 14 days | 14 to 20 days |
| Prodromal Stage | | |
| Duration | 2 to 4 days | 0 to 2 days |
| Symptoms | Severe | Mild or moderate |
| Temperature | High | Moderately elevate |
| Rash | | |
| Appearance | 2nd to 4th day | 0 to 2nd day |
| Temperature | Normal or near normal<br>Secondary rise during pustulation | Some level |
| Distribution | Centrifugal | Centripetal |
| Character | Monomorphous | Polymorphous |

## Clinical Types

A number of types of smallpox have been described. These are, severe or classical smallpox, hemorrhagic smallpox, alastrim and varioloid. The severe form is still common in Japan and other parts of the orient. The types mentioned show characteristics as follows:

1. Classical Smallpox. The severe form is characterized by a prolonged and stormy prodromal period, by numerous lesions, which may be discrete in character or so numerous that they become confluent. Pitting or scarring commonly occur following an attack of this type of smallpox.

2. Hemorrhagic smallpox is the most severe form encountered. The lesions are invaded by red cells as well as by leucocytes. It is highly fatal type of smallpox, and epidemics have been reported in which this form predominated.

Alastrim (K[illegible] Pox: A[illegible]). This form is the most common in the United States and West Indies at the present time and is considerably milder in its manifestations than classical smallpox which is still prevelent in the orient. Whether the same strain of virus causes both the severe and alastrim types of smallpox is as yet debatable. The clinical differences between variola major (classical smallpox) and variola minor (alastrim) are not clear cut. The disease is often so mild that it is frequently mistaken for chicken pox. The prodromal symptoms are generally less severe and of shorter duration than those of severe smallpox. The lesions are less numerous and more difficult to distinguish from chicken pox.

4. Varioloid. Varioloid is a modified form of smallpox occurring in persons who are partially immune to smallpox as the result of previous vaccination. A successful vaccination may have been performed years before or very recently. In general the disease is milder than severe smallpox and may be as mild as alastrim. The lesions may be few or numerous. Varioloid occurs in supposedly immune persons while alastrim may occur in supposedly non-immune individuals.

## Complications

The complications most frequently encountered are those resulting from secondary infections of the skin; namely, furunculosis, abcess formation, cellulitis and gangrene. Pneumonia is one of the most common respiratory complications.

## Treatment

The treatment of smallpox is symptomatic. There is no specific therapy. A liberal diet, plenty of fluids and good nursing care are essential in the treatment of this disease. Strict quarantine is essential. All discharges from the patient must be sterilized. The principal objective of treatment must be the prevention of secondary bacterial infection of the lesions by

maintenance of cleanliness and control of pruritis by bathing and antipruritic lotions. Sulfonamide or penicillin therapy is useful in the treatment of the septic complications. The eyes must be carefully watched and corneal ulcerations promptly and appropriate treated.

Control Measures

Vaccination with a viable vaccine is the only known measure of practical value in the control of smallpox. The high infectivity of the causal agent, the fact that the disease is transmissible during the stage of invasion, and probably during th incubation period, and the high susceptibility of the unvaccinated individual, render quarantine relatively ineffective in controllin the spread of the disease in an unvaccinated population.

When a case of smallpox occurs in a community, all persons who have not been successfully vaccinated within the previous twelve months should be re-vaccinated. Usually, it requires less time and less administrative difficulties and insures better control to revaccinate the entire population of the community without regard to previous vaccination. It will in no way incapacitate those who are immune nor will it cause them any discomfort or inconvenience. The expense involved is negligible when compared with loss of life and expense of caring for the sick

PERTINENT FACTS CONCERNING SMALLPOX IN JAPAN

Prevalence

Accurate figures on the incidence of smallpox in Japan are not available beyond 1940. However, it is known that smallpox epidemics ravaged the Orient in the last century and the disease has been at least endemic throughout this century in Japan.

The incidence was rather low between 1930 and 1945. However, there was a gradual increase in the number of cases reported beginning around 1940. The number of cases reported in 1940 was 575; in 1941, 654; in 1942, 385; in 1943, 589; in 1944, 322. Beginning in March, 1945, there was a sharp increase in the number of cases reported. A total of 1,480 cases were reported during the year 1945. There was a second sharp increase in December 1945, 268 cases being reported during the month. This may be said to mark the beginning of an epidemic which reached a peak in March, 1946 when 6,304 cases were reported for the month. From this time on, the disease declined as a result of vaccinations and other control measures to be discussed later, until October, 1946, when only five cases were reported. Since that time there has been some increase in the number of cases reported. However, this increase has not been great, and it is not expected that an epidemic will materialize this year. Up to 21 December 1946, total cases reported for the year were 17,786 with 2,735 deaths.

During the recent 1946 epidemic cases were reported from all prefectures although the principal prefectures involved were Hokkaido, Tokyo, Kyoto, Osaka and Hyogo.

Control Measures

SCAPIN 610, dated 6 January 1946 directed the Japanese Government to vaccinate all Japanese civilians employed for the occupation forces and all other civilians as required for the immediate and effective control in all areas where smallpox had been reported or may be reported in the future. It is also directed reinstatement of the pre-war compulsory vaccination program throughout Japan and the development of facilities necessary for the production of required vaccine to carry out a program for the eradication of smallpox. By April, 1946, it had become evident that the desired results in control had not been obtained. Investigation revealed that vaccinations were not completely effective as a result of improper vaccination techniques. Therefore, on 4 May 1946, SCAPIN 921 was issued directing the Japanese Government to cease using alcohol and phenol for cleansing the vaccination area and to use instead acetone or soap and water. They were directed to vaccinate or re-vaccinate all persons who did not show satisfactory evidence of a successful vaccination subsequent to 1 February 1946. This vaccination program was completed by early summer, 1946.

Since that time, smallpox has continued to decrease sharply.

Japan Vaccination Law

Regulations for vaccination were issued in 1784 and subsequently amended at various times in order to provide for compulsory vaccination. The present vaccination law was promulgated in 1909 and provided that every person submit to two vaccinations. The first must take place between the sixth and eighteenth month of life and the second in the 10th year of life. There are regulations providing for postponement of vaccination in case of sickness or other special circumstances and for the punishment of those who fail to comply with the regulations. In spite of this law, some individuals fail to get vaccinated and the cases reported are mostly in those unvaccinated individuals. Regulations also provide for special immunizations in case of need, such as threatened epidemics. It is expected that the present law may be amended to provide for an additional vaccination of children just before entrance into school. The law was allowed to lapse during the war years, and this is undoubtedly responsible for the epidemic which occurred in 1946.

Vaccine

At the present time, methods of production, storage, transportation and handling of vaccine leaves much to be desired. However, it is expected that these problems will be solved in the near future and that with a good vaccine and with enforcement of adequate maintenance vaccination programs, there should be no national epidemics of this disease in the future.